CLAIMS

What is claimed is:

1. A process for producing an epitaxial layer of gallium nitride (GaN) comprising:

forming on a surface of a substrate, a film of a silicon nitride of between 5 to 20 monolayers, functioning as a micro-mask;

depositing a continuous gallium nitride layer on the silicon nitride film at a temperature ranging from 400 to 600°C;

after depositing the gallium nitride layer, annealing the gallium nitride layer at a temperature ranging from 950 to 1120°C; and

performing an epitaxial regrowth with gallium nitride at the end of a spontaneous *in situ* formation of islands of gallium nitride.

2. A process according to claim 1, wherein the substrate is selected from the group consisting of sapphire, ZnO, 6H-SiC, 4H-SiC, 3C-SiC, $LiAlO_2$, $LiGaO_2$, $MgAlO_4$, Si, GaAs, AlN, ZrB_2 and GaN.

3. A process according to claim 1, wherein the silicon nitride layer is a layer of the Si_xN_y type.

4. A process according to claim 1, wherein the temperature of depositing the continuous gallium nitride layer ranges from 450 to 550°C.

5. A process according to claim 1, wherein the temperature of annealing the gallium nitride layer ranges from 1050 to 1080°C.

6. A process according to claim 1, wherein the temperature of depositing the continuous gallium nitride layer ranges from 450 to 550°C and the temperature of annealing the gallium nitride layer ranges from 1050 to 1080°C.

7. A process according to claim 1, wherein H_2 is present in the carrier gas.

8. A process according to claim 1, wherein the silicon nitride layer is a layer of the Si_xN_y type and wherein forming the film of silicon nitride comprises reacting ammonia and silane.

9. A process according to claim 1, wherein the temperature of depositing the continuous gallium nitride layer ranges from 450 to 550°C and the temperature of annealing the gallium nitride layer ranges from 1050 to 1080°C, wherein H_2 is present in the carrier gas, and wherein the silicon nitride layer is a layer of the Si_xN_y type and wherein forming the film of silicone nitride comprises reacting ammonia and silane.

10. A process according to claim 1, wherein the epitaxial regrowth is carried out using gallium nitride doped with a dopant chosen from the group consisting in magnesium, zinc, cadmium, beryllium, calcium, silicium, oxygen, tin, germanium and carbon.

11. An epitaxial gallium nitride layer, obtainable by the process according to claim 1.

12. An epitaxial gallium nitride layer, obtainable by the process according to claim 9.

13. An epitaxial gallium nitride layer, obtainable by the process according to claim 9, wherein the threading dislocation density ranges from 2.10^7 to 1.10^8 cm^{-2}.

14. An optoelectronic component, provided with an epitaxial layer of gallium nitride according to claim 11.

15. An optoelectronic component, provided with an epitaxial layer of gallium nitride according to claim 12.

16. A gallium nitride layer obtained by epitaxial lateral overgrowth on a crystalline substrate comprising an epitaxial gallium nitride layer according to claim 11.

17. A gallium nitride layer obtained by epitaxial lateral overgrowth on a crystalline substrate comprising an epitaxial gallium nitride layer according to claim 12.

18. A 100μm to 1 cm thick GaN layer obtained by either HVPE or sublimation on a crystalline substrate according to claim 11

19. A free standing GaN layer obtained after separating from the starting substrate of the thick layer according to claim 18.

20. An optoelectronic component, provided with a free standing gallium nitride layer according to claim 19.